FIELD APPLICATIONS™

ET #1 Water Treatment System

Eliminates Hydrocarbon Contamination

Product Developer: *ET Ventures, L.L.C.*

THE PROBLEM

In its 1996 industry survey, the Independent Petroleum Association of America (IPAA) found that the greatest concern of marginal well operators, other than crude and gas prices, is the management of produced water.

In fact, several Federal initiatives may spell trouble for the future of produced water discharge in the petroleum industry. Most importantly, produced water discharge is possible only through an exemption in the Resource Conservation and Recovery Act (RCRA)—the hazardous waste regulations. Produced water usually contains sufficient benzene, toluene, ethylbenzene and xylene (BTEX compounds) that it would be classified as a hazardous waste if it were an industrial wastewater.

Several reports by EPA, API, and IOGCC have shown that the low toxicity of oilfield waste does not warrant full regulation by the EPA, but the future still remains in the hands of Congress. In the near term, the "E&P Exemption" is vital to the domestic oil and gas industry.

To ensure environmentally safe operations, the petroleum industry is proactively searching for new technologies to economically remove free oil and soluble hydrocarbons from produced water.

THE SOLUTION

ET Ventures, L.L.C. of Johns Island, South Carolina field tested its new ET #1 produced water treatment system at RMOTC in July 1996 to determine its effectiveness in absorbing hydrocarbons from waste water. The technology had previously been proven in a laboratory environment. However, it was not known whether the product would perform successfully in a field environment where waters carry a free oil sheen and hydrocarbon concentrations can vary widely.

In a 24-hour test conducted at the RMOTC field testing site, also called NPR-3, ET #1 consistently and effectively removed hydrocarbons from produced water. Water produced from the Tensleep formation was flowed through a three-stage treatment system. The first two stages contained ET #1, a sodium bentonite compound. The final stage contained granular activated carbon (GAC).

ET Ventures, L.L.C. and RMOTC successfully tested the effectiveness of the ET #1 product in removing hydrocarbons from water produced from the Tensleep formation at NPR-3.

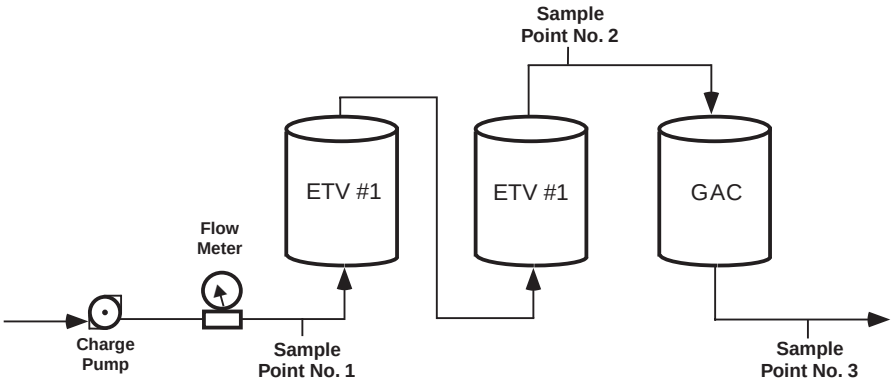
Rocky Mountain Oilfield Testing Center

THE BENEFITS

The RMOTC tests showed that the ET #1 product can be used to effectively remove oil and other hydrocarbons from water where traditional oil-water separators have had limited success. The product does not absorb hydrocarbons, but rather adsorbs them, which leaves no byproduct from the process. Independent testing conducted by ET Ventures has shown that similar results are possible in large-scale commercial applications.

Laboratory testing of spent ET #1 has shown that BTEX and other volatile hydrocarbons are adsorbed tightly enough for the spent product to pass the EPA's Toxicity Characteristic Leachate Procedure (TCLP) test and be disposed as a non-hazardous waste. The TCLP is used to identify the presence or absence of toxic chemicals that might be able to leach into groundwater after disposal. However, RCRA requires that operators perform site-specific TCLP testing prior to disposal.

When spent product is classified as a non-hazardous waste, it is possible that it can be landfilled, land farmed, or otherwise disposed in an economical manner. However, non-hazardous waste disposal options are always governed by local regulations, so operators should carefully investigate available disposal options.



In the ET #1 testing process, four sample sets were captured at three sampling points—upstream, midstream, and downstream. This method enabled comparison of contaminant concentrations across the process or at a specific point over time.

THE FIELD PERFORMANCE

After analyzing the test data, RMOTC and ET Ventures concluded that the combination of ET #1 and granular activated carbon consistently and effectively removed hydrocarbons from produced water.

Specifically, the field tests showed that the ET #1 product:

- *Reduced Total Petroleum Hydrocarbons (EPA Method 418.1) to non-detectable levels.* In all four sample sets, TPH was below detectable limits after adsorption by ET #1 alone.
- *Reduced Oil and Grease (EPA Method 413.2) to non-detectable levels.* In three of four samples, the Oil and Grease value was below detectable limits after adsorpotion by ET #1 alone.
- *Reduced soluble hydrocarbons—Benzene, Ethylbenzene, Toluene, and Xylene (BTEX-EPA Method 8020)—to barely detectable levels.* In all four sample sets, BTEX was barely detectable after adsorption by ET #1 alone. BTEX was below detectable limits when granular activated carbon (GAC) was combined with ET #1.

These three analyses were performed because they are frequently used as regulatory parameters.

THE NEXT STEP

ET Ventures is considering further development of the ET #1 product. A long-term test to determine loading capacity and breakthrough time under commercial conditions is being studied. Such a long-term test would also provide a better estimate of capital and operating expenses for a typical oilfield facility.

FOR MORE INFORMATION:

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